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ABLE SUCCESS AT EXAMINATIONS, AND IN AFTER-LIFE.

A PLEA FOR PRACTICAL WORK IN ANATOMY,

By THOMAS COOKE, F.R.C.S., Eng.,

B.A., B. Sc., M.D., Paris.

"Failure after failure is seen to greet useless and demoralising efforts to achieve painfully and by cramming what can only be done—but can be done with incomparable benefit, and the healthiest of mental enjoyments,—with just a little honest practical work."

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ANATOMY THAT CAN BE SEEN AND HANDLED;

OR

"DISSECTIONAL" *v.* THE NEW "SCIENTIFIC" ANATOMY;

BEING

A Plea for Practical Work,

And being, in conjunction with the Author's "Dissection Guides," a suggested solution of the difficulty which now presents in regard to this fundamental branch of Medical Education.

> "Morphology is but a dazzling dream—a loveable form of fantasy, which, alas! distorts the vision and warps the judgment—a fairy-tale which blinds us to the more important facts of every-day life. . . . To such as are past masters in all that can be learnt in the dissecting-room, such pure science may convey the delights of learning and culture, and may do little or no harm. But the tyro should keep clear of such fascinating seductions."

A remarkable movement has been taking place of late years in things anatomical.

There are many of the best and most enlightened men who rejoice at the progress that is said to have been made.

It is a matter of deep regret to the Author that he is not able to be at one with these gentlemen.

He takes a gloomy view of the situation. To him things seem to be going backwards!

——— "But here are discoveries upon discoveries, new facts "here and new facts there, all well authenticated and undeniable! "New and most promising vistas are opening up in every direction! "Surely science is advancing, and at a giant's pace."

——— "It is not with scientific research that I am concerned. "I am concerned with the individual men who are passing through "our schools, and who are to be the practitioners of the rising "generation. Are they dissecting? Do they know their Anatomy? "What kind of surgeons will they make? A man knows what he "deals with practically. Anything beyond this is mere borrowed "knowledge, mere tinsel that does not last. Is this the foundation "that we are building upon?"

"We are trying to teach men too much, and, as a consequence, "we are teaching them far too little."

"We are trying to teach them more than there is any "possibility of their learning *practically* in the two short years "allotted to Anatomy and Physiology. And, in relief of their too "heavy task, and ours, we are resorting to the methods of the "'crammer.' We are trusting to the easy road of plates, diagrams, "casts, and the like, instead of insisting upon men seeing things "with their own eyes, and handling things with their own hands, "and generally doing things themselves. It is submitted that we are "thus doing bad work, discreditable to ourselves as teachers, and "ruinous to our pupils. Never were there louder complaints by "the Court of Examiners as to the ignorance in practical matters "displayed by candidates for the final examinations."

The Author has long been in the habit of committing thoughts to writing, and respectfully begs leave to submit a few Notes endited at intervals.

Discussion elicits truth but slowly and piece-meal. It will not be wondered at, therefore, that such Notes should present different aspects—perhaps progressively advancing stages—of the analysis it is desired to submit of the present *sad position* of anatomical studies in this country.

I

§ 1.

"I hold," wrote to the Author, but a few years ago, the honoured President of the Royal College of Physicians, Sir Andrew Clark, "that *a complete and thorough understanding of Anatomy is essential to intelligent, successful, and honest work in Medicine.*"

The view is here respectfully submitted, and by one who probably sees more students, and from more different parts of the Kingdom, than most anatomical teachers do, that the above-

mentioned condition, "essential" to work in medicine, "*intelligent, successful*, and *honest*," is NOT at the present time generally fulfilled.

If the serious character of the position be doubted, let the following ominous words be read from the pen of the very President of one of the three Royal Colleges of Surgeons of the United Kingdom. "It is the fashion now to disparage the study of Anatomy, to regard the time spent in its pursuit as wasted," and to contend "that it does not help in practice, and is soon forgotten" —"hence the tendency to cut it out more and more from our curricula."

One does not, however, reach the bottom of this extraordinary surrender till one further reads of the "honour" due to those who, "by patient thought," etc., have "given Anatomy a higher value!" and have "raised it above physical drudgery and the mere exercise of the memory!" When, it is respectfully asked, was intelligent dissection a drudgery? When was the study of practical Anatomy a mere exercise of the memory? Alas! is it to this that we have come?

We will hope for better things. Our hearty motto shall be "Dissect well and quickly; dissecting should be a *fascinating* pursuit." Anatomy learnt by dissecting is *the one rock upon which all sound medicine and surgery rest.* Anatomy so learnt is NOT easily forgotten. Time so spent is NOT wasted. Such work is NOT drudgery.

In a sense the respected President is right. The time spent in pursuit of the kind of Anatomy that is being evolved before our eyes,—that is, of Anatomy based, not upon *individual* practical examination of the human body, but on scientific abstractions,—*however delightful and inspiring*,—and upon investigations which the Student cannot *himself* repeat,—is wasted *from a professional point of view*. Such Anatomy does not help in practice, and is indeed soon forgotten.

There stands, *per contra*, the practical success of the small band of men doing early curriculum work in the Author's dissecting-room. Long before the end of the first winter session, these are at home with scalpel and forceps, in almost every part of the human body. Not only are they the prosectors the Author mainly relies upon, but they are of the greatest service as junior "demonstrators" to the other and more advanced students of the School brought up under less favourable circumstances. This brief allusion to personal matters will be pardoned.

§ 2.

ANATOMY.—I. "Dissectional." II. "Inferential or Interpretational."

It is believed that no objection can well be raised on the ground of incorrectness to the above terms, as expressive—the former of the kind of Anatomy that has found favour up till lately

in medical circles, and the two latter of the kind of Anatomy which is now being brought to the front, and is rapidly finding its way into our Schools and text-books.

"Dissectional Anatomy" deals with structures which can be seen—seen in the usual sense of the term, seen by all who choose to look—or better, "seen and handled." Ellis' "Demonstrations of Anatomy" were "designed to teach the Anatomy of the human body by dissection;" to "treat of the characters and connections of the component parts of the human body which are visible to the naked eye;" and to supply "an efficient guide to practical knowledge." The reiteration will strike everyone as emphasising the practical purpose of this great teacher of Anatomy, who was but yesterday a living power among us, and who now appears to be forgotten: The preface to the "Demonstrations of Anatomy," from which the above quotations are taken, has been removed from recent issues of the work.

It is submitted that Anatomy, "Inferential and Interpretational," is at complete variance with the above as regards both (I.) Subject matter and (II.) Methods of Work.

(I.)—Its range is primarily the Animal Kingdom at large, and in every stage of evolution, and *secondarily only*, the fully evolved human body.

"The facts of the human Anatomy can only become intelligible when man is considered as a member of the great Animal Kingdom."—Macalister.

"The Embryological condition serves as a starting point in the description of intricate structure, the aim being to derive complex ultimate conditions from the more simple ones, and to explain the latter by means of the former."—Hertwig.

(II.)—The plan adopted is first "*inferential*." Conditions not yet noticed—which could scarcely, or could not at all, be noticed by the rank and file of Anatomists—are inferred from "homologies" and "ancestries."

"Facts revealed have led me to anticipate the existence of conditions not previously dissected."—J. B. Sutton.

There then follows the interpretation or expounding of what may, *in a sense*, be seen—of what may be seen under specially favourable or carefully prepared conditions, by a few favoured observers—and the drawing out, so to speak, of the same into meanings largely commensurate with the powers of induction of the discoverer, or discoverers.

To take but bones, which are, or should be, constantly in our hands—to take but the base of the skull, which should lay day and night on the student's table, who, till the developement of the

sphenoid (pre-sphenoid) called attention to it, ever noticed the lingula? The very division of the sphenoid into pre-and-post-sphenoid, is it founded in plain human descriptive Anatomy—that is, the only kind of Anatomy that the student can learn practically with his own hands and his own eyes? Is it on a basis of such plain human descriptive Anatomy that we refer to the post-glenoid tubercle? One would venture to ask, is it on a basis of such plain human descriptive Anatomy that we describe the inferior petrosal sinus as joining, not—as we used to put it—the lateral sinus, but the internal jugular vein outside the cranium, so as to make three compartments to the jugular foramen instead of two, as formerly?*

This "Scientific Anatomy" is taught, and *can only be taught, by plates and diagrams.*

In this connection the statement is earnestly put forward on the strength of long years of experience, and with every confidence of its being supported by all practical authorities, that the man who once gets into the way of trusting to plates and diagrams will never, to his dying day, become a sound, practical anatomist or a competent surgeon. Not only do such means not convey true knowledge, but they stand as almost insuperable barriers in the way of such knowledge ever being gained. On the face of it, plates and diagrams can only convey mental pictures—abstractions which are, unfortunately, in comparison with the actual facts, easily grasped and easily referred to in words, and are therefore, whether correct or otherwise, *tenaciously clung to.* The man who is thus enabled to talk glibly about things, which perhaps he may never even have seen, thinks he knows all about them, and has his eyes closed to observation. He, indeed, shuns contact with facts, lest they should rudely disturb his self-complacent quietude. Can the man give himself in earnest to the delicate dissection of, say, the pharynx and soft palate who is thinking all the time of Rathke's pouch, or looking for the remains of the second post-oral cleft?

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* Ellis favours the older view.

What about the newly described circular nerve to the parotid, which "leaves the glosso-pharyngeal along with the tympanic branch or Jacobson's nerve; and, after crossing the cavity of the tympanum, joins itself to the small petrosal branch of the facial; runs along this to a little behind the otic ganglion, and then changes its course, joins the auriculo-temporal, and runs backwards with this nerve to the gland"? Is this plain human Anatomy? Has anybody ever dissected this nerve? Are there not *many* other structures now described on a purely physiological basis, and which no one has ever seen in the ordinary sense of the term?

Is the man inclined to trace the external jugular vein through the parotid who believes that the "true" external jugular vein begins at the mastoid foramen?

What is the primary want of the physician or surgeon in regard to Anatomy? Is it not to acquire *visual* and *manual* familiarity with the human frame? Is it not to know, in the sense of almost seeing through, and, as far as needs be, of dextrously handling throughout, the individual man, woman, or child he is ausculating or percussing or otherwise exploring, or whose unconscious form lies under his knife on the operating table? What is it that will give him practical insight into the actual case then before him, quickness in understanding its bearings, fertility of resource in dealing with its requirements? Is it not mainly the trained hand that makes straight for the right osseous projection, the educated finger accustomed to the feel of this structure and of that, the sharp eye familiar with the most insignificant guide-point, and which recognises at once a little bit of an exposed tendon, or a certain small nerve, or a thin muscular plane? What serves Morphology here?*

What serves, either, the hyper-correctness obtained by frozen sections in connection with the soft movable viscera of the abdomen and thorax, when there are gained thereby (as is almost universally the case), neither guides in operating, nor data verifiable in dissecting?†

It is confidently submitted that we are proceeding on mistaken lines. If there is one point of all others which it is imperative to insist upon as to the kind of Anatomy required by the medical man, it is emphatically that it should be a practical and particularised, as opposed to abstract and generalised kind of knowledge. The one question with the medical man is to know, in the most matter of fact sense of the term, what is evident and tangible in one single species, Man himself. For the purposes of the medical man, generalisations are outside the scope of his primary object. And,

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* The proper use of plates and diagrams is for the purpose of indentification of the several structures by the beginner. *Plates and diagrams should not be objects of study in themselves.* This they necessarily become when they illustrate any point which the student cannot himself verify.

† To the practical mind, scientific truth is conformity to what one learns through one's senses. Even in the case of the favoured few who can keep a freezing tank, such character is conspicuously absent from the data obtained from frozen sections. It is submitted that frozen sections have done little good hitherto, beyond resuscitating, perhaps, the modified supra-pubic operation for stone.

what are we doing? We are altering our very language in the direction of generalisation. Someone inquires, waggishly perhaps, what can be meant by "upwards" and "downwards" in a fish? and instead of answering that that is no business of ours, we proceed to replace:

"Posterior," "anterior," "superior," "inferior,"
"Backwards," "forwards," "upwards," "downwards,"

so convenient and *all-sufficient*, in human Anatomy, by:

"Dorsal," "ventral," "cephalic," and "caudal,"
"Dorsalwards," "ventralwards," "cephalwards," "caudalwards,"
or, more briefly,
"Dorsad," "ventrad," "cephalad," "caudad!"

Someone asks, waggishly again, perhaps, which is the *greater*, and which is the *lesser* wing of the sphenoid in a horse? And we immediately introduce the terms, alisphenoid and orbito-sphenoid, apologetically admitting that, in the horse, the latter is larger than the former!

This constant introduction of new *generalised* terms, the drift of which is foreign to our object, as medical men, is a thing to be strenuously resisted.*

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* The drift of the scientific movement of the day is towards the description of types, and generalisations. Professional wants lie in the direction of particularism. To meet the double current of thought the Author ventures to advocate, on the one hand, descriptive Anatomy *a la* Gray, pure and simple, and side by side with this, but to be kept carefully distinct therefrom, as broad generalisations, as "transcendental" Morphology, as even Professor Gaskell can devise. But he would implore all in authority, for the sake of the students, and of the profession at large, to keep the two things *apart*. Then, and then only, will they be found not to interfere one with another.

Mr. Sutton has understood this admirably. His "Ligaments, their Nature and Morphology, is a model, from every point of view, of what such an exposé should be,—simple, unpretending, direct, and eloquent, and a masterly exposition of one of the broadest generalisations, after Darwin's and Gaskell's, which have marked the progress of modern Anatomy. The book is one that everyone should read. Let the reader judge for himself: A few of the leading passages, such as pertain more directly to human Anatomy, have been analysed (pp. 96 to 104 of the present Edition of the Tablets). If so much could be done, and done so well, in a hundred small pages in reference to the dry subject "Ligaments," it would seem that a *separate account* of the young science of Morphology, sufficient to meet all the wants of the medical profession, could easily be compressed almost in pamphlet form, instead of being scattered about in unwieldly volumes, as at present.

§ 3.

Up to some eight or ten years ago, dissecting was the principal educational occupation of the medical student, the one which, till he had passed the "primary" examination in Anatomy and Physiology, occupied more of his time than all the others put together. It is a matter of very general regret that students no longer dissect as they used to, and should, if the old standards of practical surgery are to be maintained. But the late expansion of Physiology, which has called for the bestowal on that subject of so much more time than formerly, has curtailed the time to be given to Anatomy; and a kind of theoretical or black-board Anatomy seems, as a consequence, to be taking the place of the old practical work.

There is, however, it is feared, under present educational conditions, a greater retrocession from former standards than would result from the mere transference of a part of the student's energies from certain subjects to others. There is, to all appearances, *a lowering in quality of students' work generally*. One meets now-a-days quite a number of students of no mean intellectual and general educational attainments, not apparently idle or addicted to any particular vice, who know extremely little of, and seem to care extremely little for, what one would almost call the very pillars of support of Medicine and Surgery. According to the writer's recollections this was not the case some years ago. There have always been, it is true, among students a certain number of indifferent men; but then they were men addicted to various pernicious habits, or who laboured under some marked disability. They were not, in other respects, good all-round men, such as one so frequently sees among the unsuccessful residuum of to-day.

The writer believes that the explanation of this unfortunate state of things lies in the small educational value of present *subjective*, as compared with the older *objective* methods of teaching.

We are getting our text-books of Anatomy more and more crowded every year with statements—taken mainly from the German Authors—which are probably, in the main, correct, but which are of a nature *not admitting of their being verified by the dissector*. And Anatomical teaching, following in the lines of the text-books, is becoming based more and more, not on the human body as dissected in our dissecting-rooms, but *on mere book-descriptions*. And it is considered by some that the Anatomical teacher

of to-day is sufficiently doing his duty to his pupils, if he gets them to understand what the text-books say, and to be able to give a connected account of current opinions.

How different this is from the honest practical work of but a few years ago! How inferior, in reference, not only to future practice, but even to the mere passing of examinations!

Let a man be shown a thing, or, better, be made to look for it, and find it for himself, and immediately his powers both of observation and reasoning are called forth. Let a man have merely a theoretical explanation placed before him—whether illustrated or otherwise—and he only takes in words, which "go in at one ear and out at the other." In the one case he is interested, and begins to work of his own accord. In the other, he is bored. and is only anxious to get his task over, and to scramble through the examination.

The mental habit contracted in early years sticks to a man more or less to the close of his student's career. Even men preparing for the higher examinations seem to care little for practical work. It is a most unfortunate circumstance, but the more men wish to get on with their studies,—perhaps one should say with their examinations,—whether through aiming at the higher qualifications, or through having got behindhand with their work, the more they seem to crave for plates and diagrams, as allowing them to cover, in a way, more ground in a given time.

Such work is USELESS as a basis for future practice.

Anatomy,—practical Anatomy, that is,—is our great training ground for the powers of observation, and of clear and precise diction. It is to us, medical men, what mathematics are to the physicist, and what the dead languages are to the man of letters.

A few brief notes may perhaps be added.

Several causes have contributed to the failure of Anatomy of late years. This subject has been to a great extent crowded out by Physiology. The necessarily abstract character of much of the teaching of Physiology has communicated itself more or less to the teaching of Anatomy. Since further dissections have no longer been required of rejected candidates, the teaching of Anatomy has become, from this cause also, less concrete and practical than it formerly was. In these several ways the door has been opened to the abstract and theoretical kind of work, by which the position has again been seriously menaced.

A marked feature of the anatomical attainments of the men of to-day is that, while they possess slight, but only slight, practical acquaintance with the more accessible parts of the body—arm, leg, triangles of the neck—their information, beyond these limits, seems suddenly to decline to almost complete ignorance, and

to be represented mainly by morphological scraps—*e.g.*, that the bladder is a remnant of the allantois, that the coronary sinus is a remnant of the left cardinal vein, etc., which scraps in no way imply any distinct acquaintance with the whereabouts and relations of the coronary sinus, etc. There is no point which obtrudes itself more painfully on the Author's observation than this gradual lowering year by year of the calibre of anatomical students.

A system does not establish itself, and gain considerable ascendency, without meeting a want, whether fictitious or real. Through the evident ease with which statement can be put forth, and taken in, when once showing and seeing & doing, are dispensed with, abstract teaching, as opposed to that which is practical, panders to our present taste for hurry and despatch. While the practical man is working away at the biceps, the mere listener or reader is "running over" a limb,—and this done, it is not unnatural that the Siren of inexperienced self-congratulation should whisper in his ear, "What a lot of work you have got through!"—Got through, perhaps, but not taken in.

The grasp of memory alone is feeble, and soon relaxed. The ill-worked-for gain is soon lost.

Only educate *the senses* and *the intellect*, and the gain, well earned this time, becomes permanent.

It is this spiriting away, so to speak, of the material conditions under which it is provided that work should be done, that constitutes the essence of "cramming," and gives rise to the unwholesome and delusive character of this misdirected effort.

The very rapidity with which the ground can thus, in a way, be covered is a source of the greatest danger to the student. It leads him to underestimate the amount of hard work that lies before him if he is ever to do any good; and he is thus put off his guard in reference to what should be his regularly paid contribution—*steady, persistent effort.*

This leads, in the first instance, to loss of precious time through indolence, to which evil is added, when, too late, the mistake is discovered, that of the only sad corrective still open to the backward one—a spurting effort—when the crammer is again, and this time of necessity, resorted to.

How great the evil is already—and under present circumstances it must necessarily increase—could easily be established by such expert evidence as the School of Anatomy could supply. Such evidence would establish the fact that a slight disturbing influence, such as a few days of heavy rain, or fog, or, on the other hand, of particularly fine weather—occurring a short time before the examination—keeps men back from the same in quite alarmingly large numbers: Work had been put off as long as possible through the roseate illusions above referred to, and a nicely calculated minimum of time had been allowed for *just a short spurt.* A slight miscalculation upsets the arrangement, with the result that the examination is merrily put off to the "next time," as is also, of course all serious work. Only repeat the process—and it is but too often repeated, alas!—and the student's career becomes *a succession of spurts with intervening periods of indolence!*

The system of abstract teaching now in vogue weakens the moral fibre of even good men, and obscures the old standards of practical work.

If men had to choose between seeing a thing and passing it over altogether, the majority would take some trouble to see it, and would learn something

useful. As it is, large numbers of men are deluded into the belief that they are learning when they are not learning, and that they know when they do not know. In this way honest work is often, through simple ignorance, not even attempted; and not only is the mind not educated, but examinations are not passed. Failure after failure is seen to greet useless and demoralising efforts to achieve painfully and by cramming what can only be done,—but can be done with incomparable benefit and the healthiest of mental enjoyments,—with just a little honest practical work.

§ 4.

Of the various branches of knowledge upon which rests the practice of Medicine and Surgery, there is none which is invested with such *initial* interest as Anatomy. An element of wonderment and religious awe surrounds the subject both historically, as shown by the celebrated picture of Vesalius, and individually. It can only be by some terrible mismanagement of either student or teacher that such interest can be allowed to drop, and that so fundamental a subject can come to be viewed by many with tedium, and by some, as is only too patent at the present time, with a feeling akin to loathing and disgust. The Author would urge the view that it is the *wearisome repetition*, which is the necessary accompaniment of abstract teaching, that is the main cause of this distressing change. If there is any work that it pays to do well and honestly, it is anatomical work. It is the most fatal of all errors that such work be hurried over. Everything that can be dissected should be honestly dissected and seen. It touches but the fringe of the subject to say that this is incomparably the easiest way to learn Anatomy. It is more to the point to testify, as the Author would fain do most solemnly, that the interest of Anatomy so taught is not only *indefinitely maintained*, but *increases* as opportunity offer for dissections. The chirurgical instinct is essentially that of the practical anatomist. The true surgeon is one whose proud privilege it is to study and apply anatomy, not only on the dead, but also on the living. Such is the typical anatomist. No theorist is worthy to be considered a medical man.

§ 5.

To meet practical purposes, such as are paramount in our profession, all honest teaching should first educate the senses,—in Anatomy, the eye and finger. The casting of things into words, the building up of descriptions should be an after consideration.

The Author cannot refrain from quoting a remark of one of his band of young men doing early curriculum work, a youth of nineteen, barely at the end of his first winter session, who had just been getting out the chorda tympani in the pterygo-maxillary region, and who, a few days before had thoroughly dissected a thorax, thoracic duct included, in an easy afternoon's work. He "*knew what things look like and where to find them, but he couldn't yet properly describe them.*" The artless admission reaches to the very bottom of things in regard to what formerly prevailed in connection with anatomical studies, and what prevails at present, and is the very highest commendation, because not intended as such, of work in the direction of the Dissection guides.

The Author's experience is that formerly men used to come to the School of Anatomy having dissected every "shred and fibre" of the human body, knowing well, like our young friend above referred to, "what things look like, and where to find them," and merely wanting their knowledge "focussed up," and put in order, so as to be, so to speak, get-at-able when wanted. Now-a-day conditions are totally different. Now men join, not only without precise knowledge, but without appreciating the value of precise knowledge, and wishing to deal mainly with generalities.

It is submitted that this comes very much from their being first instructed in Anatomy as an abstract science. The whole gist of such science lies in the appreciation of resemblances and differences presented as a *mental conception* rather than to the eye. It is submitted that scientific Anatomy reduces the purpose of dissecting to the illustration or exemplification of the anatomical conditions submitted. Dissecting thus becomes the conclusion or confirmation of anatomical work, rather than the starting point.

This being begun in connection with scientific Anatomy, is continued in connection with human Anatomy. The work of men to-day is essentially passive, not active and personal. They want to be taught, not to learn by their own efforts. At the present time, men wish to sit still and listen, and to have things placed before them, explained, *illustrated* by diagrams, *illustrated* by dissections. Dissecting, as far as the little goes that men do, thus becomes a mere secondary part of their anatomical work. The very idea seems absent from their minds that dissecting should be the first thing, and the basis to build upon.

Every year that present methods of teaching are in force dooms the professional career of a large number of men.

II.

EXTRACTS FROM PREFACE TO THE "DISSECTION GUIDES."

The principal positions taken up in this and the following (the earlier and more technical parts of this paper) are marked by a black line in the margin.

"Dissect well and quickly."
"Dissecting should be a fascinating pursuit."

This is a book of methods, not a systematic treatise.

The methods submitted are based upon a careful study of the several parts of the body *from the dissector's point of view*. They have been slowly elaborated by daily dissections extending over many long years.

They aim at enabling the dissector to make the best and most lasting use of each part he dissects. It will be noticed that the dissections are so planned as to allow the dissector to get down to the bones and ligaments *without removing the superficial structures*,—all structures, both superficial and deep, being thus preserved for after-study.

In physiology, we have been benefiting greatly for now some twenty years by the extension of practical work initiated by the authors of the "Handbook of the Physiological Laboratory."

No corresponding progress has, however, been made in anatomy. Admirable as are the works of Ellis, Heath, and Holden, they cannot be considered to correspond, in anatomy, to physiology, the "Handbook." They profess, in fact, to combine two things.—descriptions of the structures exposed, and rules for exposing them,—the latter being necessarily brief, and more or less overshadowed by the more voluminons descriptive element.

The immediate object of the present opuscule is to dissociate the two elements hitherto combined, with a view to giving the dissector that help which he requires in the dressing-room more fully than has hither been done,—as fully, indeed, it is hoped, as may be consistent with individual effort on the part of the learner.

The kind of anatomy aimed at in these pages,—and, indeed, though less visibly so, in the Author's other publications,—is that thorough practical acquaintance with the human body, which is comparable to everyone's knowledge of the locality in which he lives,—comparable, indeed, to the young gutter urchin's knowledge of the yards, alleys, lamp-posts, door-steps, knockers, and key-holes of the narrow precincts in which his lot is cast,—to whom the very paving stones are familiar, which he treads with his naked feet.

Knowledge of this kind is only to be obtained by careful and repeated dissections.

But for repeated dissections to be possible in the present congested state of the medical curriculum, the student must learn to dissect both efficiently and without loss,—*i.e.*, unnecessary expenditure, of time ; he must learn to dissect well and quickly.

The author's endeavour is to teach him to do this.

ON THE ART OF DISSECTING.

§ 1.

What is it that makes certain dissections more difficult than others? All will agree, for example, that a leg is harder to dessect than an arm ; but why is this ?

What is it, speaking generally, that makes a dissection difficult ? It is the small size of the structures prevalent in certain parts of the body ? No. Parts—the limbs especially, and more particularly the nerves of the limbs—are as easy, or more easy, to dissect in the fœtus than in the adult. It is the large number of structures crowded together in a small space ? No. Average dissections of the head and neck come well up to the standard of the extremities. Is it a question of muscles being easier to dissect than arteries, arteries than veins, veins than nerves, &c. ? No. The dissector who has just had a leg given him, does he not usually dissect with great minuteness the small upper branches of the femoral artery and internal saphenous vein, the lymphatics and glands, and even do his best to find the crural branch of the genito-crural nerve*—while he often neglects, later on, the larger branches of the same trunks and of the profunda ? It is that he specially cares for the "parts concerned in inguinal and femoral herniæ" ? No ; it is exceptional for these to be got out at all satisfactorily.

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* A correction is necessary in 1893 :—' This, and various subsequent exemplars, illustrate what was observable but a few years ago, but not now. ! '

It is submitted that it is the *more or less complex felting of the structures* that constitutes the difference between the several parts of the body from the dissector's point of view.

Towards the middle and greater part of the limbs, the structures run more or less parallel to each other, there is no felting to speak of, and the dissection is relatively easy. We have much the same thing towards the middle of the anterior triangle of the neck, where, however, the leading structures (principal arteries and veins) may more appropriately be said to radiate somewhat from a centre.

But the arrangement is essentially different towards the root of the limbs (axilla, Scarpa's triangle, gluteal region) ; towards the extremities (palm of the hand, sole of the foot, dorsum of the foot) ; towards the upper part of the anterior triangle (parotid region) ; and towards the lower part (root of the neck). Here complex felting prevails ; and here it is that the dissection is less easy, or, rather, *more impeded.*

Why is it that "parts" nicely begun, and promising well at first, are, after many delays, so often left unfinished ? It is simply that the dissector tires of his work ? There is a deeper reason than that. It is a question of felting. There is necessarily no felting in the superficial structures, and these are consequently always easy to clean. It is the deeper structures which, in certain regions, are felted. Here it is that the untrained dissector breaks down.

Can dissecting be made easy ? and how ?

Some will say to the dissector, Cut away the superficial structures when you have seen them, and thus make the deep ones superficial.

The plan is sanctioned by custom.

I rebel against it, nevertheless.

It deprives the student of what should be pre-eminently his own—the accumulated products of his past labour. It is now lawful to keep "parts" from one end of the session to the other (six months) ; they should be kept the full time, undamaged, and be studied over and over again. I never sanction the division of any muscle in the upper limb, except the pectorales major and minor, and sometimes the deltoid ; and I require that the outer head of the flexor sublimis digitorum be left undetached. In the lower limb, I only allow the division of the glutei maximus and medius, gastrocnemius, and soleus ; and I preserve the arch of the latter. Nevertheless, we dissect down to the bones and ligaments.

The plan of removing the superficial structures takes away the dissector's interest in his "part." The intellectual interest to be taken in dissecting lies in so planning the superficial work as to get at the deeper structures to advantage. To be a good dissector, one must be somewhat of a strategist. Practical anatomy is a question of unravelling the feltwork of the human body. The feltwork must not be cut. It is he who understands the mesh, who will dissect both well and quickly. Dissecting should be a facinating pursuit.

§ 2.

"*De fil en aiguille*"—"From thread to needle"—is a French proverbial expression descriptive of a good way to avoid losing small objects, and to easily find them again when they get out of sight. "Keep a thread in the eye of your needle;" and, if you loose sight of the needle, the thread, which you may rely upon seeing, will at any time lead you up to it.

I was working at anatomy in Paris some thirty years ago. "Subjects" were abundant, and we used to get out the same parts over and over again. It struck me one day, when dissecting the pterygo-maxillary region, that an unnecessary amount of labour was spent on each occasion by the method then, and, except with us, still at present in vogue, of getting out the facial nerve and its branches as they traverse the parotid gland. Not feeling satisfied to proceed without each time cleaning the facial nerve, nor caring to be so long over this preliminary part of the work, I set about looking for a quicker way. I found that I could cut down upon the trunk of the facial nerve without much difficulty where it crosses the root of the styloid process, a little above and in front of the transverse process of the atlas, and that, when once on the trunk of the nerve, I could trace out the branches to the face and neck in a very short time. It is in this way that I have dissected the facial nerve ever since, and many are the anatomists that I have surprised by the rapidity and completeness of detail with which I conduct the dissection. Here the transverse process of the atlas leads me to the styloid process, the styloid process leads me to the trunk of the facial nerve, and the trunk leads me to the branches.—"*De fil en aiguille.*"

I would direct attention for a moment to the sole of the foot. Have we not all seen, with a kindly pity for him, a poor unfortunate dissector first remove the skin of the sole of the foot as scrupulously as one might remove that over the periæum or the parts concerned in inguinal or femoral herniæ, and then look, in

the dense, hard, granular fat, for the plantar cutaneous nerve, and, after failing to find it—as he almost necessarily would—spend some hours more looking, also fruitlessly perhaps, for the digital nerves? How can we best help the deserving fellow? First, we should tell him that the plantar cutaneous nerve should be looked for where it leaves the trunk of the posterior tibial, and then be traced down to the sole of the foot. Then we should show him the way of finding the digital nerves by cutting straight down upon the plantar fascia and exposing the slips to the toes. This is done by first cutting down upon the back part of the under surface of the os calcis, to which the fascia is attached, and which marks the level at which the fascia is found. The dissector can now, in a few minutes, clean the whole of the fascia forwards till, in the vicinity of the metatarso-phalangeal articulations, it is seen to split up into the above-mentioned slips to toes. Between these slips, and corresponding to the intervals between the toes, the fat suddenly changes character. From being dense, hard, and granular, it suddenly becomes quite soft; and, from being previously bound down by the pressure of the undissected fascia, it comes, as soon as this is removed, to project in, so to speak, four soft pads or cushions. It is beneath these latter that the dividing trunks of the digital nerves are found, which, with the digital arteries, which are a little deeper, can now be traced to the toes without hindrance. Here the os calcis has led to the plantar fascia, which, if it had been attempted to cut down upon it directly, would probably have been cut through, to the injury of the deeper structures. The undivided part of the fascia has led to the slips to the toes; these have led to the four soft pads or cushions, which, in their turn, have led to the digital nerves and arteries.—"*De fil en aiguille.*"

Again, let us glance briefly at the popliteal space. What a crowd of superficial structures stand here in the way of the deeper ones! Small sciatic nerve and external or short saphenous vein, with the two branches of origin of the external saphenous nerve; then, beneath the fascia, the sural arteries and veins, and the nerves to the heads of the gastrocnemius and plantaris; how they impede the dissection of trunk artery, vein, and nerves! Can we wonder at the dissector missing the articular arteries? Is there a way of rendering the dissection, at least relatively, easy?

Dissect wide of the popliteal space itself, clean and lift up the inner head of the gastrocnemius on the one hand, and the outer head on the other. Beneath them you will find the inferior internal articular artery running downwards and inwards upon the tibia,

and the inferior external articular passing horizontally outwards above the head of the fibula. Deal similarly with the muscles bounding the space superiorily, the biceps on the one hand, the semi-tendinosus and membranosus on the other; and the superior internal and superior external articular arteries, if they are not seen at once, can at least be felt upon the femur in the midst of the bed of fat in which they lie. Then, from beneath the raised muscles, the trunk artery, vein, and nerves can be reached, and thoroughly cleared and isolated with the finger. The dissection of the space is now half completed. Here again, "*de fil en aiguille.*"

Examples could be multiplied almost *ad infinitum.*

The "*De fil en aiguille*" principle is the best guide to the dissector when looking for the smaller structures.

It is the best guide for the demonstrator when helping the student out of his difficulties with his "part."

I have always noticed that there are certain stages in the dissection of almost every part of the body, at which the average dissector is stopped by difficulties which he is unable to overcome, unless a little help be given him.

The deep dissection of Scarpa's triangle is a case in point. The dissector has got out fairly, we will say, femoral artery and vein and anterior crural nerve, with the beginnings, but little more than the beginnings of their principal branches. But now he is uncertain how to proceed. He does not know how to follow out the branches. He tries one, and finds he cannot get on far with it because there is something in the way. He tries another, with the same result. After doing his best for a time, he gives up the effort, and leaves the part unfinished. I am sure that everyone who has spent, if only a few weeks, in a dissecting room, will be familiar with the case here depicted. To give this dissector a fresh start, all that I have usually found necessary is to show him that he must first thoroughly free and lift up the branches of the anterior crural nerve, in order to get fairly at the external circumflex artery; and that he must then separate the adductor muscles, so as to get upon the profunda artery with its internal circumflex and perforating branches, and upon the obturator nerve and vessels.

The dissection of the upper part of the anterior triangle of the neck (parotid region) is another similar instance. Where the carotid artery and its later branches dip into the parotid gland, the student finds the deeper dissection hampered by the great auricular nerve and external jugular vein, which, with us at least, he is taught to preserve; by Steno's duct—to him a something *sui generis* which

he has a difficulty in identifying; and by the branches of the facial nerve, so beautifully, but so perplexingly depicted in plates. Here again, after spending much time in vain efforts, the student once more finds himself stopped in his work. It suffices, I have always found, to put him on the trunk of the facial nerve, as already explained, showing him how its radiating branches *cross* the trunk of the carotid and its later branches, so that he can trace out the nerves in the parotid gland without injuring the arteries, to start the dissector once more "on his way rejoicing,"

§ 3.

Every art has its more or less precise rules, which, if excellence is to be attained, must be carefully applied from the very first. We would lay down four cardinal rules for the dissector:—

1. *The dissector should most carefully study his part BEFORE BEGINNING TO DISSECT IT.* He should study it on plates; he should study it in the museums he has access to,—on the model dissections always left out for study in our anatomical school; he should study it on the dissections of others. The contrast cannot be too sharply accentuated between the dissector who earnestly studies his part first and dissects it afterwards, and he who dissects it first and reads about it afterwards. The former, while he is dissecting, knows what he is to look for; where things are, what they look like, how they run; where he is on safe ground and can cut freely, where he may do damage and must be cautious. He is planning his operations so as to make the most of his opportunity. He is doing work both enjoyable and of the highest possible order. The best descriptions are but imperfect embodiments of scientific truth: our worthy friend is critically examining and checking such as his teachers have placed before him, and he is laying the foundation of that individual acquaintance with things which lies at the base of all true knowledge. The other dissector, on the contrary, is blindly bungling through his work, laboriously cleaning, perhaps, a muscular artery because it chances to be large, and removing a ganglion with its roots because, being small, it fails to catch his untrained eye. When he sets to read, he finds that many things of interest have been cut away from his part, and that he has himself greatly restricted his opportunity of learning.

2. A point to which the dissector should pay great attention from the very first refers to the cleaning of all arteries, veins, and

nerves. These "long organs" (as, in fact, all the organs of the body) lie in a sheath of connective tissue, which is but *slightly adherent* to them. Why this is, will be easily understood. It is a general rule that, wherever there is pressure of friction, there the cellular tissue becomes laminated and free from fat—*i.e.*, aponeurotic or semi-aponeurotic. It is this condensed layer (more or less condensed according to circumstances) that constitutes the sheath of either artery, vein, or nerve. Let the dissector get his knife *within* the sheath, and he will find it *will easily peel off. By getting, and keeping within the sheath, the dissector will clean things efficiently, neatly, and quickly.* The only necessary precaution is to keep the knife *from* the side of the "long organ," from which any important branch is known to be given off.

Much the same thing may be said of muscles. We do not generally speak of the sheath of a muscle. A muscle is surrounded, nevertheless, by a closely fitting covering of connective tissue, or fascia. If the dissector knows how to set about his work, he can peel this covering off with the greatest ease,* thoroughly baring the contractile fibres. No more important advice can be given to the dissector than that of thoroughly cleaning all muscles as soon as they present in the course of dissection. All muscles should be cleaned from origin to insertion, and not in front only, but all round, except, of course, where their nerve, or a large artery, enters their substance. Nothing can do more to further good dissections than the habit of cleaning all muscles early and well. Nothing can hamper the dissector more than the neglect of this part of his work. This leads us on to 3.

3. When an artery, vein, or nerve is to be sought in an intermuscular space, this space should first be *opened up as widely as possible. by dissecting close to, and carefully cleaning, the muscles themselves.* This preliminary part of the work will bring the dissector upon the "long organs" which it is desired to trace out *to the greatest advantage.* Opportunities for the useful application of this rule are to be found everywhere. It is a rule of the *very widest application.*

Where an intermuscular space can be opened both from the front and from the back, it is well to delay completing the dissection till the space can be opened: *e.g.*, dissection of the dorsalis scapulæ artery and circumflex vessels and nerve in the triangular and quadrilateral spaces at the back of the shoulder; of the anterior tibial artery as it pierces the upper part, and of the anterior peroneal artery as it pierces the lower part, of the interosseous membrane of the leg; of the radial artery as it passes from the dorsum to the palm of the hand, first between the two heads of the first dorsal interosseous muscle or abductor indicis, and then between the adductor pollicis and the inner head of the flexor brevis.

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* Except as regards the cutaneous surface of a very few muscles, such as deltoid, gluteus maximus, upper part of the trapezius, the first layer of muscles of the sole of the foot.

4. *All superficial structures* should be thoroughly cleaned from end to end, so as to be *got well out of the way* (not necessarily removed) before the deeper ones are taken. The dissector should dissect in broad even planes, or strata. The dissection should not be deepened over any small area, and left superficial all round. This rule should be more particularly observed in such parts as Scarpa's triangle, the triangles of the neck, the popliteal space, the bend of the elbow.

§ 4.

It cannot be too strongly impressed upon the dissector that a dissection should be worked at steadily every day till it is completed. A dissection once completed, and of which all the structures are well cleaned, will keep nice for months. Not so with a part which is left unfinished. This spoils more rapidly than the inexperienced would easily believe, and it can never be made attractive.

All structures that are *nearly bared* should be cleaned thoroughly before work is left off for the day. While a thick layer of fat or fascia left over a structure will preserve it for a time from drying, and keep it fresh, a thin layer, especially of laminated cellular tissue not containing much fat, will, on the contrary, dry up with the structure, and become so thoroughly incorporated with it, that it can never properly be removed. Even the plan of moistening the part will not help much in the case of small structures which have once been allowed to dry; besides which, wetting a part washes out the colour of the muscles, and first whitens and then darkens the connective tissues, so that distinctions of structure previously quite plain are effaced, and the work rendered much more difficult and uncertain. Parts should be dissected while fresh, if good work is to be done. Dissection is twice as easy then as it is later on.

III.

HOW THE ABOVE VIEWS HAVE BEEN CARRIED OUT

IN THE PRESENT EDITION OF THE TABLETS.

In this Edition, the Author has yielded to the new views in a way which, he hopes, will be free from the reproach roughly sketched in the foregoing pages.

The two aspects of Anatomy,—the practical, or "dissectional," as the Author would call it, and the "scientific,"—have been kept entirely separate, the former only being cast in the tabulated form, while the latter is in the shape of detached notes grouped together here and there throughout the book. Nothing has been included in the tabulated part but what can easily be exposed in the dissecting-room, and seen with the naked eye and handled.*

It is believed that it is in the commingling of that which is not exactly Anatomy, with Anatomy in the proper sense of the term,—that is, in the commingling of the Anatomy that cannot be seen and handled with that that can,—that the dangers referred to will be found to lie. How can the dissector take heart in his work when any considerable part of what he looks for is found to be beyond the reach of scalpel and forceps !

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* Following the example of Mr. Luther Holden, who believed that "diagrams" would defeat the object of his excellent "Landmarks," the Author has done his best to exclude illustrations from the notes above referred to. Some have, of a necessity, been introduced, as, without illustrations, many of the statements would have been unintelligible—a sure proof, to the Author's mind, that the matter, which has with some regret been dealt with, is really extraneous to the main subject, and such as should not be introduced along with plain human Anatomy. A small book on Morphology, such as Mr. Sutton could write most admirably (see note, p. 9), would solve the difficulty under which the profession is now labouring with reference to the teaching of "Scientific Anatomy."

A few examples will make plain what is meant, and will show how the several difficulties inherent to the distinction indicated have been dealt with throughout the book.

I.—Comparative Anatomy. We are all familiar with the cervical transverse process—"bifid, groved superiorly, perforated by a foramen at its base." This transverse process is now divided, in scientific Anatomy, into an anterior part, or costal process, the supposed homologue of the ribs of the dorsal region, and a posterior part, the transverse process proper. The foramen also is re-described in this way:—A "costo-transverse lamella," projecting forward from the "transverse process," joins the back of the costal process, and so the space between the two processes becomes enclosed as the "costo-transverse foramen."

This is interesting. But it has the drawback, from the point of view of the ordinary medical student, that for three obvious facts, easily verified, easily remembered, easily applied, there is substituted a more or less roundabout statement, and a theory.

Further, it may be asked, can the teacher demonstrate the new view, bone in hand? Not conveniently. He will usually put down the bone, and go to the blackboard and draw.

The new description will be found in the notes, not in the Tablets proper.

II.—Embryology. The embryologist discovers the extremely interesting history of the development of the retina and pigmentary layer—formerly of the choroid, now of the retina—from that outgrowth of the optic thalamus, which we call the primary optic vesicle,—which history, so that the present argument may be followed by the reader not quite familiar with embryology, is given below in small type, as far as it bears on the subject, in approximately the language of the Tablets.

> **Primary Optic Vesicle, and Optic Cups.** The primary optic vesicle is a flask-shaped outgrowth of that portion of the anterior cerebral vesicle which forms the optic thalamus. Its pedicle becomes filled up with nervous substance, and forms the *optic nerve*, and, by joining with its fellow, the *optic commissure*. As it expands, the primary optic vesicle comes in contact with the *lens* already formed in front of and a little below it. The lens is generally said to press upon the primary optic vesicle so as to (1) invaginate its lower and anterior half into its upper and posterior half, and thus (2) obliterate its cavity. Whatever explanation be given of the change, the antero-inferior aspect of the primary optic vesicle comes to present a depression or cup, a gradually deepening depression or cup, the *optic cup* (Foster and Balfour); and the more this cup deepens, the more is the cavity of the primary optic vesicle

encroached upon. Finally the walls of the optic cup come in contact with the posterior and upper walls of the primary optic vesicle. Then, on the one hand, the cavity of the primary optic vesicle has ceased to exist, and, on the other hand, there are two cups, of which the first one the lower or smaller one, the *optic cup*, is included within the other, upper, or larger one. The lower or smaller cup, or optic cup, thickens considerably, and becomes the *retina*. The upper or larger cup remains relatively thin, and forms the *pigmentary layer*—formerly of the *choroid*,—now of the *retina*.

The old nightcap illustration, so frequently used in demonstrating the various peritoneal invaginations, is now applied to a new purpose. The good old gentleman, who pushes one half of his nightcap into the other, does not make two nightcaps of it. "Why, then," says the scientific anatomist, "when the embryonic lens invaginates the primary optic vesicle, do you describe two optic cups,—one, which is to become the retina,—and the other, which is to become the pigmentary layer of the *choroid?* Fuse the pigmentary layer of the choroid with the retina, and have but one nightcap. Call this layer the pigmentary layer of the *retina*." Says the anatomist of the old school, "When I dissect the eyeball, I see, floating in the water of the trough, the thin, semi-transparent and pinkish retina, and, outside this, the almost black vascular membrane, which I have always called the choroid,—the former as distinct from the latter, both in structure and function, as is the thin calico lining of the coat I wear, from the warm broadcloth outside—the one impressed by the delicate images painted upon it by light, the other deadening the too active rays."

Can the teacher demonstrate the new description on dissected eye-ball as he used to demonstrate the old one? Not conveniently. Again, he will usually go to the blackboard and draw.

III.—Minute Anatomy. The subjects studied by the Scientific School have been mainly beyond the range of scalpel and forceps, and in the direction of minute research.

Take, for instance, the question of the fibres in the cerebro-spinal nerve centres, upon which hang so many urgent considerations having reference both to diagnosis and to treatment. The coarser instruments used in the dissecting room are obviously not suitable for throwing light upon this important subject. Even our microscopes have proved inadequate. Information has been gained only from physiological investigations regarding the degeneration of divided or otherwise injured nerve tracts, and from observation as to the order in which, in the embryo, the white medullated fibres characteristic of adult life take the place of the grey non-medullated ones.

The physiologist, as an expositor of new views, has a right either to expand or to narrow down, to any reasonable extent required for the easy formulation of such new matter, the meaning he wishes to attach to the words he uses.

He at first accepts,—to return to the nerve centres,—the anatomist's description of the Restiform bodies as "two wide and thick bundles of fibres, the apparent prolongation of the posterior columns of the cord, which, diverging superiorly, both expose the grey matter of the floor of the fourth ventricle, and form the lower part of the lateral boundary of that cavity." But now he finds that the funiculus gracilis, a constituent part of the Restiform body as above described, either continues upwards beneath the grey matter of the floor of the fourth ventricle to form part of the fasciculus teres, or, as has been stated more recently, ends in the claval nucleus; and, quite legitimately, he makes a first alteration in the meaning he wishes to attach to the term "Restiform body." He makes a "Restiform body No. 2" to include the processus cuneatus and cerebellar fibres only.

The physiologist now goes a step further. He finds that the fibres of the processus cuneatus do not pass up so far as he first thought; that they also end in a corresponding nucleus, the nucleus cuneatus; and that the upper part of the Restiform body is formed mainly, not by the processus cuneatus, as previously believed, but by some new "arciform fibres" derived from the newly defined "formatio reticularis." What does the physiologist now do? He again and again, on perfectly legitimate grounds, alters the meaning he attaches to the term "Restiform bodies." He limits the application of the term to the upper part of "Restiform body No. 2," thus creating a "Restiform body No. 3." After a time, perhaps, we shall have a "Restiform body No. 4," and so forth. All this is perfectly legitimate. As advances are made, both new terms, and new meanings for old terms, must be conceded.

But how about the anatomical teacher?

Previous to the progress of recent years, the teacher would hold up the medulla and show to the class what the class can *see*, namely, "Restiform bodies No. 1,"—two wide and thick bundles of fibre, which, etc.; then he would similarly show them the narrow lateral tract, the rounded and prominent olivary body, the anterior pyramid, and so forth. Then the senior members of the class, would, with care, handle the preparation; and those dissecting the head and neck would, with more or less success, make preparations to match the teacher's. This was the good old time!

Since the progress referred to, how does the teacher stand in regard to the medulla? Can he show to the class the "Restiform body No. 1,"—the only "Restiform body," be it noted, that the class can see and handle? Scarcely. If he must describe the Restiform body of the physiologist, which no naked eye can define, or microscope either, except fragmentarily, he must go to the blackboard, and draw.

The two descriptions of the medulla will be found facing each other, one in the Tablets proper, the other in the notes.

IV.—Applied Anatomy. Let us consider another recent development of the science of structure akin, in many respects, to the foregoing.

Prof. Charcot, an authority on diseases of the nervous system, was writing on the burning question of cerebral localisation. He had naturally new views to submit,—with facts to put forward, previously, we will suppose, unnoticed, in support of the same. He overhauled the anatomy of the arterial supply of the brain with this object in view. He had an indefeasible right, in the pursuance of this object, and within the bounds of reason, both to create new terms if he needed them, and to use old terms in new and special senses adapted to his purpose.

Prof. Charcot's work on cerebral localisation appeared now some eight or ten years ago. Far from it being, therefore, to the detriment of the Pofessor that his views be handed down to the student in such form and shape as are within the student's reach, it is rather due to the Professor that they should be so handed down. On the part of an editor of a student's text-book, it is no "cribbing" to introduce Charcot's views.

But the question arises, where, and in what form, should these views be introduced?

A general summary of Charcot's views would evidently be in its proper place in an article in a book on medicine, headed Cerebral Hæmorrhage. That view is pregnant with useful deductions, which brings to our notice the "terminal" character of the arterioles of the central or ganglionic system, the "semi-terminal" character of the arterioles of the peripheral or cortical system; the absolute non-communication of the two systems; and the existence, therefore, on the borderland of these systems, of a stratum of brain substance but slightly vascular, of diminished nutritive activity, and specially exposed to softening.

There can be no doubt either that such a summary would also be in its place in a work on applied anatomy.

But the question arises. Are the more specially anatomical parts of Charcot's statements, with all the corresponding new terms and new descriptions, in their best place in a book on *descriptive* Anatomy?

Can the demonstrator going over the arteries of the base of the brain, *show* to the assembled class the six sets of arterioles of Charcot's central or ganglionic system—Antero-median, antero-lateral, postero-lateral, and so forth? Can he *show* them the ten or twelve sets of the peripheral or cortical system,—Anterior and internal frontal, Middle and internal frontal, Posterior and internal frontal, and so forth? Scarcely. Such points are beyond the range of easy demonstration, to a class, on the dissected parts. The teacher, therefore, as before, goes to the blackboard and draws.

The new description will be found, not in the Tablets proper, but in the notes.

V.—Frozen Sections. In 1872 Braune began his frozen sections. He corrected several current statements as to levels. Thus the trachea is now known to bifurcate opposite the fourth or fifth dorsal vertebra, and not opposite the third, as formerly stated; and so forth. His plates also suggested the revival of the supra-pubic operation for stone.

But Prof. His goes a step further. He extracts the frozen viscera from their cavities, makes casts of them, and re-describes the internal organs such as they are supposed to exist in the living body,—of course out of sight. The descriptions tally beautifully with the plaster of Paris models, but they do NOT correspond to what we see either in the anatomical "subject," or on the living patient, when, for surgical purposes, the cavities are opened, and the viscera exposed.

Can the teacher demonstrate the new descriptions of the viscera on the dissected body? It stands to reason that he cannot.

"Then," says the student, "why should I dissect? The 'parts' are all wrong. I shall only get false impressions if I dissect. I will leave the dirty thing alone!

Once started, the thing goes on. More and more is shown on the blackboard, and by diagrams and models. Things are made

so plain! The class understands so well! You can cover so much more ground in a given time! The students quite like it!

The description of His's plaster of Paris models is given *side by side* with the old descriptions of the viscera *as seen in the dissected "subject."* The old descriptions have been left standing, however, with a few minor corrections.

VI.—Inductive reasoning is altering the human body,—in description. Take a single joint, the shoulder-joint. Four additions to its anatomy are already made, three of which have received the high sanction of leading text-books read by all students: For the attachment of the ligamentum teres there is a depression *(fovea capitis)* on the head of the femur: to correspond to it, there must be another *fovea capitis* on the head of the humerus. There is a ligamentum teres in the hip joint: there must be, to correspond to it in the shoulder-joint, Flood's ligament or superior gleno-humeral fold; there must be also, for similar reasons, an inferior gleno-humeral fold or Schlemm's ligament; and a transverse humeral ligament, or ligament of Golden Brodie, "the analogue of the strong process of bone which connects the two tuberosities in the musk ox."

Students never took much to dissecting joints and ligaments. Is it really hoped that they will dissect these (to them*) new ligaments? Will they not learn about them mainly from plates and diagrams?

"It is the worst form of cram," says, somewhat grandiloquently perhaps, a writer of the new school, "to teach the bald facts of Anatomy unenlightened *(sic)* by general laws."

Let us listen to a man of real genius, Mr. J. B. Sutton, an old pupil of the School of Anatomy, who, while an oracle among the morphologists, yet knows how to appreciate things at their true value, from a *practical* point of view:—

> "The reasons for regarding the gleno-humeral ligament (or gleno-humeral band when it merely appears as a thickening in the capsule) as the divorced tendon of the subclavius muscle may be briefly enumerated."
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> "Viewed in the full bearings of this speculation, the history of the subclavius is as instructive as that of any muscle could well be. Commencing with menobranchus we see it arising from the precoracoid, and, at its insertion, enveloping the outer aspect of the head of the humerus, being muscular throughout."

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* Flood's ligament was referred to by Prof. Humphry in his treatise on the Skeleton as far back as 1858, the date of the *first* edition of Gray's Anatomy.

> "Next we see it luxuriating in full perfection in flying birds, its distal end metamorphosed into tendon, performing the laborious and important function of raising the wing."
>
> "Lastly, in man, it becomes reduced to almost insignificant proportions, lying, as a small second-rate muscle, under the clavicle, and representing, in its retirement, the middle portion only of the bird's *levator humeri*, its proximal end degenerated into a uniting band to connect the clavicle with the first costal arch, whilst its outer end is represented by the coraco-clavicular ligaments, and by the SMALL INSIGNIFICANT BAND, so far as function is concerned, known as the gleno-humeral ligament."

If we look around, we see our knowledge extending in every direction by leaps and bounds. Through present Collective Investigation arrangements, it will soon be increasing faster still. We are already at pains to store it, except somewhat as raw material. We lack the co-ordinating power to work it into shape. The danger is that, as individuals at least, we may lose our grasp of the despised "bald facts" above allued to. Some of our more advanced leaders are already affecting to look down on Gray's Anatomy. The Author ventures to take his stand on this incomparable text-book. In the way of honest dissecting-room work, it is practically impossible, he believes, to add much, as regards all-round excellence, to the masterpiece which we owe to the genius of Henry Gray. Though poor Gray [He was in many ways an unfortunate man] died within a year of the publication of his book [1858], and his hand thus failed to direct its progress during the early trying years of criticism, the work, discreetly edited, and practically untouched as regards naked-eye Anatomy, has now moulded, more than any other work on Anatomy, over thirty generations of students, and seems to become more and more every year the necessary pillar of support of anatomical knowledge among medical men in all English-speaking countries. As an artist, also, Gray is unapproached. There are no plates or woodcuts in existence as demonstrative, as regards what the student really wants to see, as those, whose outlines he at least inspired.*

The author hopes he may not be misunderstood.

What, as a matter of fact, is this Flood's ligament, which the editors of Gray's Anatomy have left out in the cold for over thirty years, and which only now comes to light? Merely, in most cases, a slight thickening of the capsule, visible only on its inner surface, and less marked than the coraco-humeral thickening. But a theory now attaches to it; hence its present prominence. Should the theory fall, as perhaps it may, to a certainty the ligament will again be forgotten.

* See preface to *first* Ed. of Gray's Anatomy.

Let the pure scientist,—let every man during such part of his career as can be devoted to science, indulge to his heart's content in the highest range of thought of which he may be capable. This is the *sine qua non* of a liberal education. Let him revel in all forms of knowledge within his reach. This is simply doing his duty.

But let him, when he comes to professional work, bear in mind that the basis of such work is a *practical and specialised* kind of knowledge, a kind of knowledge that appeals to the senses of sight and touch,—not an abstract and generalised knowledge.

The two things are distinct, and should be kept apart.

Let us be content, as human anatomists, to deal with obvious matters of fact, visible to the naked eye, palpable, dissectable. The dead body, as examined in our dissecting-rooms, is the one standard we, as human anatomists, should abide by. We should describe what can be really and truly seen by ordinary dissecting-room processes, or such processes as are within every student's reach, and nothing else. With regard to frozen sections, if we feel called upon to keep a freezing tank in our dissecting-room, then let us adopt this mode of study; but not otherwise. Never did anyone learn Anatomy to any useful medical purpose, except by thoroughly honest practical work.

Let us, as human anatomists, take our histology from the physiologist. Let us *fortiori* take our morphology from the naturalist.

None of this is Anatomy in the *medical or surgical* sense.

Apology is offered for the *quasi* counter-movement here attempted. That some effort seems called for at the present moment can scarcely be doubted. "Dissecting is becoming a lost art!" "We are becoming demoralised!" said recently two of the teachers of the largest London medical schools, who were discussing the subject with the Author.

Never before, it is believed, have men done so little thorough practical work in Anatomy.

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